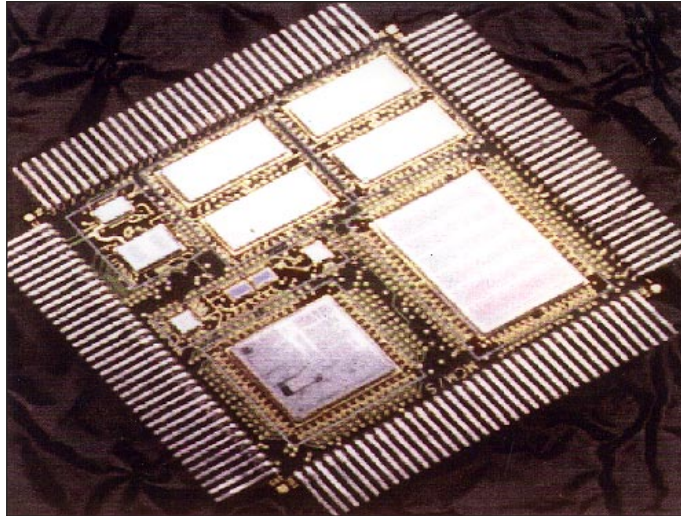




GENERAL PURPOSE NOISE CANCELLATION PROCESSOR HAS COMMERCIAL APPLICATIONS



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Payoff

The size and cost of active noise and vibration control electronics was reduced by putting all electronics on a multi-chip module. Only two inches square, the QuietChip electronic computer replaces computers that are 100 times larger and 50 times more costly. This technology now makes it more feasible to use active noise and vibration control systems in commercial aircraft, automobiles and ships.

Accomplishment

Under a program sponsored by the Materials and Manufacturing Technology Directorate, Bolt Beranek & Newman (BBN) Inc, developed an electronic computer designed to perform the control functions in generalized active noise and vibration control systems. This electronic computer, called QuietChip, was miniaturized by fabricating it as a multi-chip module (MCM). Each QuietChip accepts up to 20 analog inputs from vibration and noise sensors and delivers up to four analog outputs to vibration actuators or sound loudspeakers.

Background

The cost and size of large control-computers have been the principal barriers to the use of active noise and vibration control (ANVC) in commercial applications. Current ANVC systems are computationally very complex, often requiring computer systems with more than one billion floating points of 32 bit processing with a computational latency of 10 micro-seconds or less. Since the cost of these computer systems is so high, ANVC systems have been used primarily in high-value military applications. The smaller and cheaper computer system developed under this program would meet the requirements of most ANVC systems. Such systems are now in use by the Navy to reduce ship-radiated and ship-interior noise. The Army is developing ANVC systems to quiet tanks and trucks, and increasing use of ANVC is expected to reduce helicopter noise and vibration. MCM technology was developed during the early 1990's at several companies, often with Defense Advanced Research Projects Agency support. QuietChip is the first hybrid, 40 Mflop computer built as an MCM. It has a nine-layer substrate with a 13 integrated circuit die on one side and a number of surface mount parts on the other. Up to twelve MCMs can be paralleled on the same data bus to expand the ANVC system size. All design and manufacturing files were transferred electronically and the completed MCMs were debugged over the internet via modems. Six MCMs were used in parallel computing architecture to successfully demonstrate an ANVC system that reduced road and engine noise in an automobile supplied by General Motors.